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What type of physical exercise works best to improve movement and quality of life for people with Parkinson's disease? - A Cochrane Review summary with commentary

Claudio Cordani[a,b,*] and Bianca Mosconi[c]
[a]*Department of Biomedical, Surgical and Dental Sciences, University "La Statale", Milan, Italy*
[b]*IRCCS Istituto Ortopedico Galeazzi, Milan, Italy*
[c]*IRCCS Fondazione Don Carlo Gnocchi, Milan, Italy*

Abstract.
BACKGROUND: Parkinson's disease (PD) is a progressive neurodegenerative disorder diagnosed by motor symptoms of bradykinesia, in combination with tremor, rigidity, or postural instability. Many studies document the effects of exercise-based interventions, but the benefit of different exercise types remains unclear.
OBJECTIVE: To provide a commentary on the Cochrane Review by Ernst et al. on the effectiveness of different types of physical exercise regarding motor signs, Quality of Life (QoL), and the occurrence of adverse events.
METHODS: A systematic search was performed in CENTRAL, MEDLINE, Embase, and other databases. The search was performed also in trial registries, conference proceedings, and reference list of identified studies.
RESULTS: The review included 154 RCTs (with 7837 participants). The network meta-analyses (NMAs) on the severity of motor signs and QoL included data from 60 (2721 participants) and 48 (3029 participants) trials, respectively. The evidence from the NMA suggests that dance, gait/balance/functional training probably have a moderate beneficial effect on the severity of motor signs, and multi-domain training probably has a small beneficial effect on the severity of motor signs. Endurance, aqua-based, strength/resistance, and mind-body training might have a small beneficial effect on the severity of motor signs. In addition, aqua-based training probably has a large beneficial effect on QoL, and mind-body, gait/balance/functional, and multi-domain training and dance might have a small beneficial effect on QoL.
CONCLUSIONS: Current evidence supports the promotion of physical exercise among people with PD, identifying only small differences between exercises in influencing the severity of motor signs and QoL.

Keywords: Parkinson disease, quality of life, exercise, exercise therapy, systematic review

*Address for correspondence: Claudio Cordani, PT, PhD (s), Department of Biomedical, Surgical and Dental Sciences, University "La Statale" and IRCCS Istituto Ortopedico Galeazzi, Via C. Belgioioso 173, 20157 Milan, Italy. E-mail: claudio.cordani@unimi.it.

The aim of this commentary is to discuss from a rehabilitation perspective the Cochrane Review "Physical exercise for people with Parkinson's disease: a systematic review and network meta-analysis"(Ernst et al., 2024) by Ernst M, et al,[a] published by the Cochrane Central Editorial Service. This Cochrane Corner is produced in agreement with NeuroRehabilitation with views* of the review summary author in the "implications for practice" section.

1. Background

Parkinson's disease (PD) is a complex progressive neurodegenerative disorder (Poewe et al., 2017). Bradykinesia and at least one additional cardinal motor feature (rigidity or rest tremor) are the clinical hallmarks of PD. An increasing number of studies document that exercise-based interventions can improve specific parameters, such as gait speed, balance control and freezing, and quality of life (QoL) in people with PD (Fox et al., 2011; Cordani, 2023). Simultaneously, new research evidence suggests a potential neuroplastic and neuroprotective effect of activity-enhancing approaches (Johansson et al., 2020). However, it remains unclear if some exercises work better than others.

Physical exercise for people with Parkinson's disease: a systematic review and network meta-analysis

(Ernst M, Folkerts AK, Gollan R, Lieker E, Caro-Valenzuela J, Adams A, Cryns N, Monsef I, Dresen A, Roheger M, Eggers C, Skoetz N, Kalbe E, 2024)

2. Objectives

The aims of this Cochrane Review were: i) to compare the effects of different types of physical exercise in adults with PD on the severity of motor signs, QoL and the occurrence of adverse events; ii) to generate a clinically meaningful treatment ranking using network meta-analyses (NMAs).

2.1. What was studied and methods

The review authors conducted a literature search across 12 databases and trial registries, as well as several conference proceedings to find randomized controlled trials (RCTs) and cross-over trials published up to May 2021. The population addressed was adults with idiopathic PD. No restrictions were applied regarding sex, educational age and presence of cognitive impairment. Authors included trials comparing different types of physical exercise with each other, with a control group, or both. The primary outcomes were the severity of motor signs and QoL, shortly after the intervention. Secondary outcomes were: freezing of gait, functional mobility and balance, as well as adverse events.

3. Results

The review included 154 RCTs with 7837 participants with mostly mild to moderate PD and no major cognitive impairment.

The NMAs on the severity of motor signs (60 studies including 2721 participants) found that, compared to passive control group:

- Dance probably has a moderate beneficial effect (standardized mean difference [SMD] –0.76, 95% confidence interval [CI] –1.11 to –0.40; 5 RCTs).
- Gait/balance/functional training probably has a moderate beneficial effect (SMD –0.56, 95% CI –0.85 to –0.26; 2 RCTs).
- Lee Silverman Voice Treatment (LSVT) BIG might have a moderate beneficial effect, but the evidence is very uncertain (SMD –0.50, 95% CI –1.23 to 0.23; 1 RCT).
- Multi-domain training probably has a small beneficial effect (SMD –0.44, 95% CI –0.68 to –0.20; 6 RCTs).
- Endurance training might have a small beneficial effect (SMD –0.43, 95% CI –0.73 to –0.13; 4 RCTs).
- Aqua-based training might have a small beneficial effect (SMD –0.38, 95% CI –0.78 to 0.03; 1 RCT).

[a]This summary is based on a Cochrane Review previously published in the Cochrane Database of Systematic Reviews 2024, Issue 4. Art. No.: CD013856. DOI: 10.1002/14651858.CD013856.pub3 (see www.cochranelibrary.com for information). Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, and Cochrane Database of Systematic Reviews should be consulted for the most recent version of the review.

*The views expressed in the summary with commentary are those of the Cochrane Corner authors (different than the original Cochrane Review authors) and do not represent the Cochrane Library or Wiley.

- Strength/resistance training might have a small beneficial effect (SMD –0.37, 95% CI –0.71 to –0.03; 1 RCT).
- Mind-body training might have a small beneficial effect (SMD –0.27, 95% CI –0.54 to 0.00; 6 RCTs).
- Evidence on the effect of flexibility training is very uncertain (SMD 0.31, 95% CI –0.12 to 0.74; indirect evidence only).
- No direct or indirect evidence was found for gaming.

The NMAs on QoL (48 studies including 3029 participants) found that, compared to passive control group:

- Aqua-based training probably has a large beneficial effect (SMD –0.86, 95% CI –1.33 to –0.39; 1 RCT).
- Gaming might have a moderate beneficial effect, but the evidence is very uncertain (SMD –0.51, 95% CI –1.33 to 0.31; indirect evidence only).
- Mind-body training might have a small beneficial effect (SMD –0.41, 95% CI –0.77 to –0.04; 3 RCTs).
- Strength/resistance training might have a small beneficial effect, but the evidence is very uncertain (SMD –0.38, 95% CI –0.73 to –0.02; 2 RCTs).
- Endurance training might have a small beneficial effect, but the evidence is very uncertain (SMD –0.37, 95% CI –0.78 to 0.05; 2 RCTs).
- Gait/balance/functional training might have a small beneficial effect (SMD –0.35, 95% CI –0.61 to –0.09; 4 RCTs).
- Multi-domain training might have a small beneficial effect (SMD –0.30, 95% CI –0.54 to –0.06; 6 RCTs).
- Dance might have a small beneficial effect (SMD –0.22, 95% CI –0.62 to 0.17; 4 RCTs).
- Evidence on the effect of flexibility training is very uncertain (SMD 0.11, 95% CI –0.59 to 0.81; indirect evidence only).
- No direct or indirect evidence was found for LSVT BIG.

The evidence suggests that freezing of gait was decreased for endurance training compared to active or passive control groups. The evidence suggests that functional mobility and balance were increased for 7 interventions (aqua-based training, endurance training, gait/balance/functional training, mind-body training, strength/resistance training, dance and multi-domain training) compared to a passive control group. Moreover, the NMA indicates that aqua-based training increased functional mobility and balance compared to an active control group and compared to flexibility training. Furthermore, endurance training and gait/balance/functional training demonstrated significant improvements compared to flexibility training.

The evidence is very uncertain about the effect of physical exercise on the risk of adverse events.

4. Conclusions

Most types of physical exercises demonstrated positive effects on the severity of motor signs and QoL for people with PD, but there is little evidence of differences between these interventions. Although the evidence is very uncertain about the effect of exercise on the risk of adverse events, the interventions included in the review were described as relatively safe.

4.1. Implications for practice in neurorehabilitation

For people with PD, exercise is considered an integral part of disease management process, and is recommended by international guidelines to improve motor symptoms and QoL (Kim 2019). The review authors performed a NMA trying to rank the main exercise categories, but little differences were found. Such findings highlight the general importance of physical exercise for people with PD to improve severity of motor signs, QoL, and functional mobility and balance, even if the exact exercise seems to be secondary in influencing these outcomes. The small differences between exercises might be also due to the heterogeneity of PD clinical manifestation that might benefit from complex interventions which combine different exercise methodologies and PD-specific programs. In light of these considerations, findings from the present review can only partially inform the selection and application of any specific exercise intervention. Moreover, the certainty of evidence is mainly low to very low, indicating relevant methodological shortcomings. Larger, well-conducted studies are needed to increase confidence in this evidence.

In line with previous research, the review authors did not find major safety concerns for the interventions considered. However, considering the limited

and heterogeneous reporting of adverse events, great attention should be paid to the patient safety, especially for those people in advance disease stages.

As regards the sustainability of training effects, the review focused on short-term improvements only. However, as for many others chronic diseases, it can be assumed that people with PD would benefit from exercising continuously over the course of the disease to maintain beneficial effects. Healthcare professionals should therefore promote an integration of physical exercises into patients' routine according to careful clinical assessment and follow-up.

Conflict of interest

The authors declare no conflicts of interest.

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References

Cordani, C. (2023). How effective are current interventions for preventing falls in Parkinson Disease? A cochrane review summary with commentary. *Am J Phys Med Rehabil*, *102*(8), 736-737. doi: 10.1097/PHM.0000000000002256.

Ernst, M., Folkerts, A. K., Gollan, R., Lieker, E., Caro-Valenzuela, J., Adams, A., Cryns, N., Monsef, I., Dresen, A., Roheger, M., Eggers, C., Skoetz, N., & Kalbe, E. (2024). Physical exercise for people with Parkinson's disease: A systematic review and network meta-analysis. *Cochrane Database Syst Rev*, *4*(4), CD013856. doi: 10.1002/14651858.CD013856.pub3.

Fox, S. H., Katzenschlager, R., Lim, S. Y., Ravina, B., Seppi, K., Coelho, M., Poewe, W., Rascol, O., Goetz, C. G., & Sampaio, C. (2011). The movement disorder society evidence-based medicine review update: Treatments for the motor symptoms of Parkinson's disease. *Mov Disord*, *26*(Suppl 3), S2-S41. doi: 10.1002/mds.23829.

Johansson, H., Hagströmer, M., Grooten, W. J. A., & Franzén, E. (2020). Exercise-induced neuroplasticity in Parkinson's disease: A metasynthesis of the literature. *Neural Plast*, *2020*, 8961493. doi: 10.1155/2020/8961493.

Kim, Y., Lai, B., Mehta, T., Thirumalai, M., Padalabalanarayanan, S., Rimmer, J. H., & Motl, R. W. (2019). Exercise training guidelines for multiple sclerosis, stroke, and Parkinson disease: Rapid review and synthesis. *Am J Phys Med Rehabil*, *98*(7), 613-621. doi: 10.1097/PHM.0000000000001174.

Poewe, W., Seppi, K., Tanner, C. M., Halliday, G. M., Brundin, P., Volkmann, J., Schrag, A. E., & Lang, A. E. (2017). Parkinson disease. *Nat Rev Dis Primers*, *3*, 17013. doi: 10.1038/nrdp.2017.13.